



## Science Profile

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### **Mitloehner goes full "Debunki-nator" on livestock's role in greenhouse gas**

When it comes to dispelling myths about animal agriculture's environmental impact on greenhouse gas emissions, air quality scientist Frank Mitloehner may be the Schwarzenegger of science communicators.

On Twitter, he goes by the clever handle @GHGGuru, which gives some insight into Frank Mitloehner's status as animal agriculture's leading scientific voice on livestock greenhouse gas emissions (GHGs).

In fact, in the weeks following the January publication of the EAT-Lancet report that laid the planet's environmental woes at the feet of meat and livestock, the University of California-Davis professor and air quality scientist's tweets challenging the commission's findings received more than 2.5 million impressions.

As his recent social media posts about the EAT-Lancet paper suggest, this is not Mitloehner's first rodeo when it comes to calling out what he considers factual inaccuracies about livestock production and the environment. And he's found plenty, whether it's the commission's recommendation that red and processed meat consumption should be reduced by as much as 90 percent to promote dietary health or its use of the often-cited yet incorrect statistic that global meat production is responsible for 18 percent of GHG emissions.

For Mitloehner, who holds the first air quality extension specialist position established at any U.S. university animal science department, amplifying the science and debunking the myths about the environmental impact of livestock systems has been a hallmark of his career.

Ten years ago, when a well-publicized United Nations Food and Agriculture Organization report claimed that livestock produced more greenhouse gases than the global transportation system, the Debunk-inator was born. Mitloehner refuted that claim and then became active with the very same UN FAO partnership project to benchmark the environmental footprint of livestock production, eventually serving as the committee's chair.

Meatingplace caught Mitloehner between tweetstorms to discuss current issues in understanding and mitigating air emissions from livestock operations.

MEATINGPLACE: What's our current knowledge about the environmental impact of livestock production?

MITLOEHNER: There is no doubt that animal agriculture is facing challenges around its impact on the atmospheric environment. Whether that's odors or whether that's gases such as ammonia or particles, or whether it's greenhouse gases, I think we are all in agreement that animal agriculture is a source of these pollutants. The question is, how much of a source? And second, what can we do about it? How can we mitigate potential impacts?

I have worked on this for 20 years and the topic has never subsided. And I think people need to take this discussion seriously. I know there's always this initial kind of joking around [about] cow farts. It's not about cow farts. [GHG emissions] is a serious issue that is crushing the legacy of animal agriculture as we know it.

MEATINGPLACE: What does the science say about the contribution of animal agriculture to air quality issues?

MITLOEHNER: There are some real, some perceived and some constructed scenarios here. The real scenario is that livestock does produce reactive nitrogen. Reactive nitrogen can impact water waste and can impact the air. So, whether it is nitrate going through groundwater or whether it is ammonia affecting air quality and contributing to the formation of particles, there's no doubt that animal agriculture contributes to this.

Another issue — a societal issue — is that livestock does contribute to certain levels of nuisances. Nuisances are those conditions that impair the neighbor's right to enjoy their property, so that could be odors or dust or flies. I think that's not controversial and there are many people trying to reduce these impacts.

I think what is more controversial is what recently has become a No. 1 area of discussion around animal agriculture, and that's the impact of animal agriculture on climate, particularly the contribution of livestock on methane.

Here, it seems that all of those who previously used different narratives, such as animal welfare, animal rights, food safety and so on, have changed their story to focus now on the contribution animal agriculture has on methane.

What I find telling is that some of the people who do so seem to be well-meaning, but most of them are ill-informed as to what the truth is about methane and its significance to climate change.

MEATINGPLACE: What are some of those truths?

MITLOEHNER: Now, it gets complicated quickly but methane is totally different from other greenhouse gases. The other greenhouse gases, such as CO<sub>2</sub> and nitrous oxide, are long-lived. Once they're emitted and up in the atmosphere, they live for hundreds of thousands of years. Methane is drastically different. Methane only lives for 10 years and then it's destroyed and made into other gases, such as CO<sub>2</sub>.

Why does that matter? It matters because if you have constant, or even declining, herds and flocks of livestock and poultry, then you will not add additional methane to the atmosphere. The reason is that the equal amount of what's produced by livestock is also destroyed by chemical processes in the atmosphere, specifically a process called hydroxyl oxidation.

The critics of animal agriculture like to inform the public of the emissions that stem from animal agriculture as contributing to these gases in the atmosphere, and that's fair. What's not fair is the facts that they leave out: that almost the equal amount of methane that's produced is also being destroyed or sequestered by soils.

Here's an analogy: It's like going to the bank and emphasizing your financial income stream but leaving out your expenses. Every banker would know that that's ridiculous to do, but this is what our critics do in and around animal agriculture.

MEATINGPLACE: Can you give a bit more detail about this methane in-methane out concept?

MITLOEHNER: I'll give you some numbers. Globally, there are 560 teragrams [a teragram = 1 trillion grams] of methane produced from all sources. At the same time, globally, a total of 550 teragrams of methane — so almost as much as what's produced — is being destroyed or sequestered by soil. There's a contribution, of all sources in the world, not of 560 but of 10 teragrams.

The critics of animal agriculture love that topic of greenhouse gases because they know that livestock produce methane. But that methane would only matter if we were to increase livestock herds because then we would add methane to the atmosphere and that would be a big problem. But if we keep our herds and flocks constant, we're not adding new methane to the atmosphere and hence we're not adding additional global warming.

Another important point is that if you manage to reduce methane by shrinking herds, and we have done that over the last 50 years, it actually leads to global cooling. It has a cooling effect because now you're taking methane molecules out of the atmosphere that can no longer absorb heat from the sun.

MEATINGPLACE: Since the publication of the EAT-Lancet Commission report in January, you've been at the forefront of calling out its discrepancies. Can you talk a little about that?

MITLOEHNER: Yes. The EAT-Lancet [report] has two main premises. Basically, it says that we should change what we eat, and in particular, we should reduce animal-based diets to a large extent in order to protect human health and the environment. [The authors] claim, at least in all of the public media outlets that I've seen, that a switch from current diets to a plant-based diet or a largely plant-based diet will have tremendous impact in improving human health and protecting our natural resources.

Now when you go into this report, you'll see Figure 6, which is a table that purports to show how various diets affect the environment differently. These include their reference diet, the EAT-Lancet diet, versus the 'dinners as usual' diet, a vegan diet, a vegetarian diet, and a pescetarian diet. Or, at least that's what they try to accomplish. The various different diets were assessed for the impact on greenhouse gases on water, on land and by diversity.

They looked hard to find differences across diets on the environmental side. However, when you actually look at that table you will find that despite their attempts to find these differences, they didn't find any. No differences across diets for water. No differences across

diets for land use. No differences in any major way. There's only one area, environmental, that differed between their diet and a usual diet.

MEATINGPLACE: Have you communicated that to the EAT-Lancet Commission?

MITLOEHNER: I actually asked the authors of EAT-Lancet to clarify because there are some major mistakes in that report around greenhouse gases and ways to calculate those. Again, I have asked for clarification because I have identified several mistakes and I have received recognition that they are looking into it, but I have not yet received a cohesive and coherent response.

In my opinion, the greenhouse gas portion of that report is flawed and the differences that they are depicting are inaccurate. The environmental portion of EAT-Lancet does not show any differences across any of the environmental parameters that they have looked at, and for them to stand in front of the world media and say that they have found the solution to save both people's health and planet's health is irresponsible and inaccurate.

MEATINGPLACE: You often talk about the value of animal agriculture. Can you explain a bit more about that?

MITLOEHNER: That's a difficult question, and the reason why it's so difficult is because animal agriculture has such a profound impact on so many different areas. Not just that it provides jobs to billions of people [around] the world — that's billions with a 'b' — but in addition to meat, milk and eggs, animal agriculture provides various byproducts without which we cannot really imagine living.

If you were to totally exclude animal products from our food supply chain, you would pretty much diminish two-thirds of all the food we eat. I'll give you one example. True vegans will not only forego meat and milk and eggs but they will forego anything that has anything to do with the use of animals. And that means they will not even eat food crops that were pollinated by bees or other pollinators.

Now think about what that means and how many plant-based foods fall out of your diet plan if you don't allow pollinators to do their work. In fact, two-thirds of all food we consume today would not be available to you if you were to follow a true vegan diet. And instead — and I know many vegans and I'm surrounded by vegan students — when I see what they eat, I find that a lot of what they eat has been designed to taste like animal-based food — to taste like mayonnaise, or meat, or milk.

And when you look at how these things are produced, you'll find that most of the them are ultra-processed foods that require a lab with some food scientists in order to achieve equivalent taste and optics and aroma and so forth. That is a planet that I don't want to live in, one that, in my opinion, would take away so much of the joy of life that we all share when we eat food.

You tell me what artificial process could be more perfect than the process of photosynthesis producing forages and so forth, and then animals being able to consume those forages and

making them into high-value proteins. You show me one lab-based process that is more perfectly designed than that.

MEATINGPLACE: What did you think about EAT-Lancet's recommendations related to nutrition?

MITLOEHNER: When you compare most plant-based foods with most animal-based food items, you'll find that animal-based foods are extremely nutrient-rich. Meaning, if you drink a glass of milk or you eat an egg or you eat a piece of beef, the nutrients you consume in those condensed food items are way beyond what anything in the plant kingdom can provide. Many of the plant foods, and processed plant-based foods in particular, are quite calorie-rich but nutrient-poor.

The EAT-Lancet [Commission] and others want to put a massive tax on nutrient-dense animal-based diets, and therefore make it even less affordable to people who need it the most — those who lack the financial resources and can only afford calorie-rich diets. I think that's highly unethical.

I think this whole discussion of calorie versus nutrient density and why that matters is really important and often overlooked. For example, compare a glass of dairy milk with a glass of almond juice. People evaluating the biological value of these different items will tell you that dairy milk has the highest biological value. The almond juice has about half that biological value.

Why? Because the digestibility of those proteins and the bioavailability of those products to humans are in a perfect balance made for ingestion and digestion by us. Whereas many of the plant-based proteins are incomplete, meaning essential amino acids are lacking and therefore, the biological value of those plant-based proteins is often limited.

The discussion that you oftentimes hear — 'Hey, we should just replace animal-based protein with plant-based protein,' and then counting them one-to-one, is a false discussion because 1 gram of animal protein is not the same as 1 gram of plant protein. The animal protein is much more bioavailable and digestive to humans.

MEATINGPLACE: Does the concept of upcycling make a difference when we're talking about value?

MITLOEHNER: Livestock, by and large, particularly ruminant livestock, has a story to tell — a story of upcycling. Upcycling means that you take non-human-edible beef and you convert it into highly valuable protein sources that are contained in animal-based diets.

For example, many people think that raising beef the way we do in the United States is a total waste of human edible food. What these people don't know is that while we have 90 million beef cattle in the United States, only 15 million of those are in feedlots at any given time. And they eat a concentrate-rich diet, but they only do so for the last three or four months of their lives. Before they go to the feedlot, they spend two-thirds of their lives on pasture.

In other words, on average, a beef animal in the United States eats 80 percent of its lifetime feed in the form of non-human edible feed. And the vast majority, particularly of ruminant

animals, occurs on land that is considered marginal. And marginal means that this land is not really suitable to grow crops because the soil is not good enough or there's not enough water.

About two-thirds of all land in the United States used for agriculture is marginal land, and the remainder is arable land where they grow the crops. Foregoing livestock would mean we don't make use of two-thirds of all agricultural land in this country.

MEATINGPLACE: What are the top challenges for livestock producers going forward?

MITLOEHNER: In my opinion one of the greatest challenges — and opportunities — is to satisfy the so-called 2050 challenge, which means finding ways to feed 9.5 billion people in the next three decades. By 2050, there will be 9 billion people in the world or more — up from 3 billion when we were young — which means the human population on this planet will have tripled.

But the natural resources to feed these people will not have tripled. We will not have three times more water, three times more land, three times more fertilizer. That means that we have to find a way to produce way more food with fewer resources. The fact is that we know how to do it. In fact, we have been doing it in the United States for a long time.

By that, I am referring to the dairy industry, which is a good example and could be applied to all animal species. Back in 1950, we used to have 24 million dairy cows. Today, we have 9 million dairy cows. With this much smaller dairy herd we are producing 60 percent more milk. We have shrunk our dairy herds by three-fold, but we have increased milk production with a much smaller herd by 60 percent. That effectively has shrunk the carbon footprint of a glass of milk by two-thirds.

MEATINGPLACE: What can livestock producers do in terms of reducing greenhouse gas contribution?

MITLOEHNER: Animal agriculture actually holds the key to mitigation of fossil fuel-related greenhouse gases. To me, it's important to tell farmers to stop fighting this climate change battle. I hear them say, 'Well, we don't believe in it, or if it does happen, animal agriculture has nothing to do with it.' I have news for you because, yes, you do contribute.

But inform yourself and get the whole story and get it right because then you will find that by far the most important culprit is not animal agriculture but the use of fossil fuel. That is the main contributor to greenhouse gases and to climate change caused by human activity. Inform yourself and don't be a bystander, and don't be that person who just stands there and shakes his head saying, 'No, no, no. It's not us, it's the others.'

Animal agriculture needs to wake up to this challenge, and I really mean wake up. The farming community needs to become aware that this is not just an important topic but that it is perceived by the public as the most important topic.

Producers need to find out what their farm or operation actually emits, then we can talk about the next steps.

If there are areas where we need to reduce, how do we reduce that in a cost-effective way? In most cases, reducing emissions will mean that you will, at the same time, include efficiencies.

Reducing emissions hardly ever comes at the expense of financial viability of the farm, if you do it right.

Online May 2019 at:

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